

IPC-2518A

Sectional Requirements for Implementation of Part List Product Data Description [PTLST]

“The data model of this standard shall be in effect until 2001-12.” At that time, the committee will consider changes, revision, other actions.

IPC-2518A
November 2000

A standard developed by IPC

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- Contain simple (simplified) language
- Just include spec information
- Focus on end product performance
- Include a feedback system on use and problems for future improvement

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- Keep people out
- Increase cycle time
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Adopted October 6. 1998

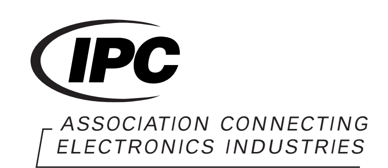
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IPC-2518A



[PTLST]

Sectional Requirements for Implementation of Part List Product Data Description

A standard developed by the Computerized Data Format Standardization Subcommittee (2-11) of the Data Generation and Transfer Committee (2-10) of the Institute for Interconnecting and Packaging Electronic Circuits.

The GenCAM format is intended to provide CAD-to-CAM, or CAM-to-CAM data transfer rules and parameters related to manufacturing printed boards and printed board assemblies. The requirements of IPC-2511 are a mandatory part of this sectional standard.

This standard is part of the GenCAM 1.5 release.

> **"The data model of this standard shall be in effect until 2001-12."** At that time, the committee will consider changes, revision, other actions.

Users of this standard are encouraged to participate in the development of future revisions.

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Acknowledgment

Any Standard involving a complex technology draws material from a vast number of sources. While the principal members of the IPC Data Generation and Transfer Committee of the IPC Data Transfer Solution DTS Subcommittee are shown below, it is not possible to include all of those who assisted in the evolution of this standard. To each of them, the members of the IPC extend their gratitude.

Data Generation and Transfer Committee	Data Transfer Solution DTS Subcommittee	Technical Liaisons of the IPC Board of Directors	
Chairman Harry Parkinson Digital Equipment	Chairman Harry Parkinson Digital Equipment	Stan Plzak Pensar Corp.	Peter Bigelow Beaver Brook Circuits Inc.

Special Note of Thanks

Key Individuals — An executive group of personnel from different computer disciplines helped to make this document possible. To them and their dedication, the IPC extends appreciation and gratitude. These individuals are:

Dieter Bergman, IPC

Jerry Brown, eSeeData

Yueh Chang, Northern Telecom

Anthony Cosentino, Lockheed Martin

Dino Ditta, Router Solutions

Allan Fraser, GenRad

Barbara Goldstein, NIST

Doug Helbling, Intel

Michael McCaleb, NIST

Michael McLay, NIST

John Minchella, Celestica

Robert Neal, Agilent

Richard Nedbal, Advanced CAM

Harry Parkinson, Digital Equipment

Michael Purcell, Infinite Graphics

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1 SCOPE

This standard specifies data formats used to describe parts lists and bill of material generation methodologies. These formats may be used for transmitting information between printed board designers, board fabricators, and assembly manufacturers.

The information can be used for both manual and for digital interpretations. The data may be defined in either English or SI units.

1.1 Interpretation

"**Shall**", the emphatic form of the verb, is used throughout this standard whenever a requirement is intended to express a provision that is mandatory. Deviation from a **shall** requirement is not permitted, and compliance test modules (CTMs) developed to check syntax and semantics, will prompt the user to correct the ambiguity, or to insert missing information.

The words "should" and "may" are used whenever it is necessary to express non-mandatory provisions.

"Will" is used to express a declaration of purpose.

To assist the reader, the word **shall** is presented in bold characters.

1.2 Parts List Product Manufacturing Focus

The GenCAM format requirements are provided in a series of standards focused on printed board manufacturing, assembly, inspection, and testing. The generic standard (IPC-2518) provides information on requirements focused on parts lists or bill of material methodology. The generic standard, IPC-2511, contains general requirements and is a mandatory part of this standard. Suggested usage and examples for parts lists are contained in this standard.

2 APPLICABLE DOCUMENTS

The following documents contain provisions which, through reference in this text, constitutes provisions of IPC-2518. At the time of publication, the editions indicated were valid. All documents are subject to revision and parties to agreements based on this generic standard are encouraged to investigate the possibility of applying the most recent additions of the documents indicated below.

IPC-T-50		Terms and Definitions for Interconnecting and Packaging Electronic Circuits
IPC-2511	(MANGN)	Generic Requirements for Implementation of Product Manufacturing Description Data and Transfer
IPC-2512	(ADMIN)	Sectional Requirements for Implementation of Administrative Methods for Manufacturing Data Description
IPC-2513	(DRAWG)	Sectional Requirements for Implementation of Drawing Methods for Manufacturing Data Description

IPC-2514	(BDFAB)	Sectional Requirements for Implementation of Printed Board Fabrication Data Description
IPC-2515	(BDTST)	Sectional Requirements for Implementation of Bare Board Product Electrical Testing Data Description
IPC-2516	(BDASM)	Sectional Requirements for Implementation of Assembled Board Product Manufacturing Data Description
IPC-2517	(ASEMT)	Sectional Requirements for Implementation of Assembly In-Circuit Testing Data Description
IPC-2519	(MODEL)	Sectional Requirements for Information Model Data Related to the Printed Board and Printed Board Manufacturing Descriptions

3 REQUIREMENTS

The IPC-2511 document describes the generic requirements of the GenCAM format. The format specifies details specifically for information interchange of data related to printed board manufacturing, assembly and test.

GenCAM is comprised of twenty sections as described in the generic GenCAM standard, IPC-2511. The sections are shown in Tables 3-1 and 3-2 of the IPC-2511.

Each section has a specific function or task respectively and is independent of each other. Accordingly, the information interchange for a specific purpose is possible only if the sections required for such a purpose have been prepared.

3.1 Categories and Content

Table 3-1 provides the section names that are appropriate for the list of material. There are two unique functions that can be defined by the use of these sections of the GenCAM system.

Table 3-1 indicates the relationships of the requirements for various sections within the descriptions for a particular process. The letter **"M"** signifies a mandatory requirement. The letter **"O"** signifies an optional characteristic that may or may not be pertinent to the particular section. . A dash signifies an extraneous section (unnecessary); CTMs will not reject file summaries if extraneous sections are present.

The table signifies two requirement conditions separated by a "/". The first representation of requirements is intended to convey those GenCAM sections that **shall** be available as the initial input to the Assembly processes. The second instance of a requirement is to signify those data that **shall** be available once the processing descriptions have been completed.

Table 3-1 GenCAM Section Relationships for List of Material

File Identifiers	Parts List Drawing	Parts List
HEADER	M/M	M/M
ADMINISTRATION	M/M	M/M
PRIMITIVES	O/O	-/-
ARTWORKS	O/O	-/-
LAYERS	-/-	-/-
PADSTACKS	-/-	-/-
PATTERNS	-/-	-/-
PACKAGES	-/-	-/-
FAMILIES	-/-	-/-

File Identifiers	Parts List Drawing	Parts List
DEVICES	O/O	O/O
MECHANICALS	O/O	O/O
COMPONENTS	M/M	M/M
ROUTES	-/-	-/-
POWER	-/-	-/-
TESTCONNECTS	-/-	-/-
BOARDS	O/O	M/M
PANELS	-/O	O/O
FIXTURES	-/O	O/O
DRAWINGS	O/M	O/O
CHANGES	-/O*	-/O*

* The CHANGES section is used independently to alter previously sent files. Included **shall** be a HEADER section (for revision status and identification) and an ADMINISTRATION section to show effectivity

The correlation between the various descriptions identified in this standard are indicated in Figure 3-1. This shows the relationship of the various parts list data.

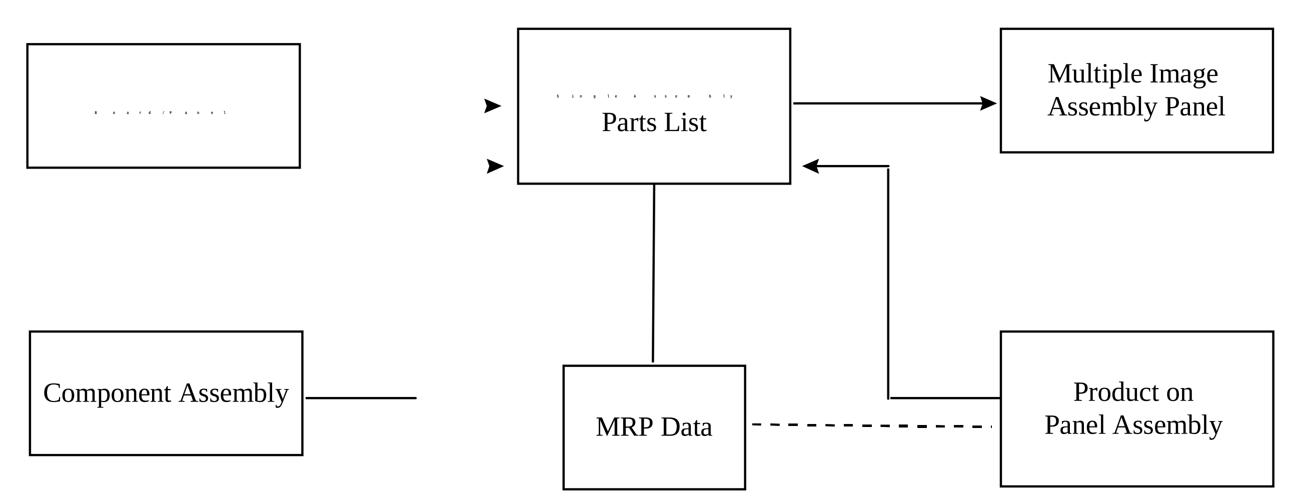


Figure 3-1 Parts List Activity Requirement

4 GENERAL RULES

The following details reflect the rules used in GenCAM to meet the requirements for list of material. These rules are intended to meet the needs of the manufacturer to understand the customer requirements.

Wherever necessary, additional requirements have been detailed to reflect precision. The attributes and rules for GenCAM described in IPC-2511 are required.

Wherever necessary, detailed descriptions or definitions of the entities, attributes or characteristics are described according to the following issues detailed in Table 4-1 and descriptions.

Table 4-1 Assembly Parts List Keyword Identifier

Need Identifier	Section	Keyword Usage
Part Number	DEVICES	DEVICE.PART.<enterprise.part_id>
Package Description	DEVICES	DEVICE.<package_ref>
Supplier Part Number	DEVICES	DEVICE.PART.<enterprise_ref>
Alternate Parts	DEVICES	DEVICE.ALTERNATE
Aliases or part substitution	DEVICES	DEVICE.ALIAS
Device Quantity	COMPONENTS	Count the total instances of COMPONENT.DEVICEREF.<part_ref>
Part Reference Designators	COMPONENTS	COMPONENT.<ref_desg>
Part Specifications	DRAWINGS	DRAWING.<drawing_type> = SPECIFICATION
Item Number		The item number is not tracked within the GENCAM file. It is a function of the ERP system.
Assembly Part Number	HEADER	ASSEMBLY.<assembly_id>
Assembly Variation/Configuration	HEADER BOARDS	ASSEMBLY<assembly_id> using a different number for the assembly. ASSEMBLY.USING.<group> is then used to select a different set of devices to populate the board.
Part Classification	DEVICES	DEVICE.<device_type>
Package	PACKAGES	PACKAGE.<package_name> PACKAGE.<package_type>
Mechanical part	MECHANICALS	MECHANICAL.<part_name>
Mechanical part quantity	COMPONENTS	Count the total instances of COMPONENT.MECHANICALREF.<mechpart_ref>
Engineering Change Effects Corrections To Previously Sent Data	CHANGES	CHANGE.ADD CHANGE.DELETE CHANGE.RENAME CHANGE.ADDPRODUCT CHANGE.DELETEPRODUCT CHANGE.RENAMEPRODUCT

5 MODELING

The data files of GenCAM may be mapped to the information models. Information models are developed to ensure that complete mapping is capable between the information provided within the GenCAM characteristics. The correlation is provided in the activity models shown in IPC-2519.

All data activities are based on activity models as defined in IPC-2519. The activity models covered by CAD and CAM include the engineering, design, administrative, and fabrication and assembly characteristics. Each of these sections are intended to be detailed into various levels of activity much like layers of information needed to perform a particular manufacturing process.

Figure 5-1 shows the activity needed to develop parts list data.

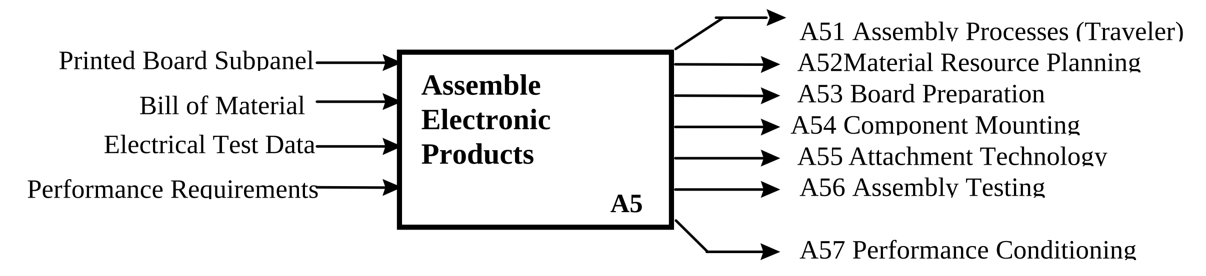


Figure 5-1 Parts List Data

5.1 Information Models

Information models are also helpful in understanding the requirements of the parts list product manufacturing section. Attribute information is correlated to the parameters of GenCAM as well as to the activity models used to describe parts list data.

EXPRESS is an international information modeling format supported by ISO 10303-11. The graphic representation of EXPRESS is known as EXPRESS-G. Appendix A provides an explanation of the different EXPRESS-G requirements. Figures 5-2 through 5-5 show the EXPRESS-G version of the GenCAM DEVICES, COMPONENTS, and MECHANICALS sections. See www.gencam.org for complete EXPRESS-G model.

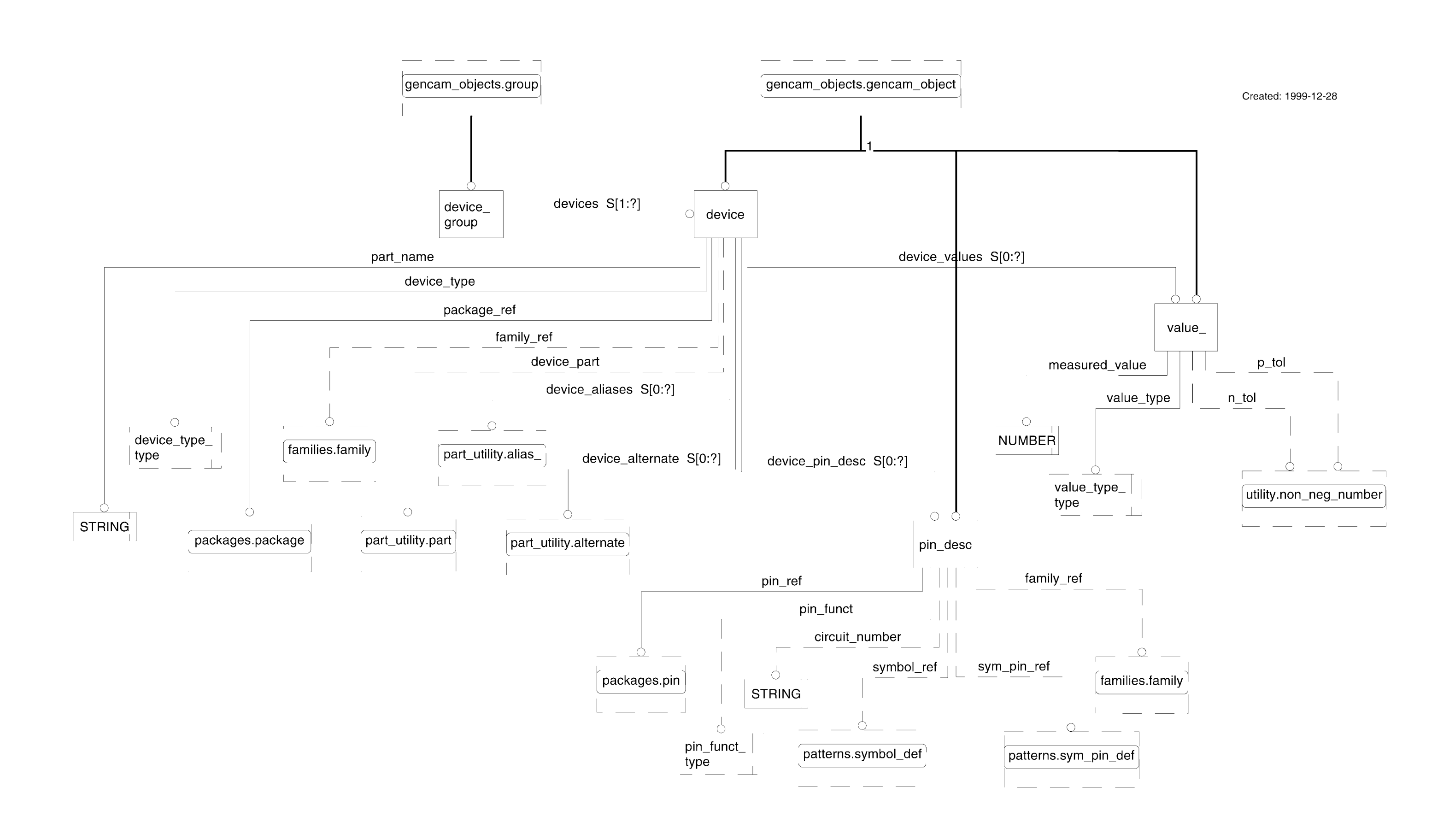


Figure 5-2 EXPRESS-G for DEVICES

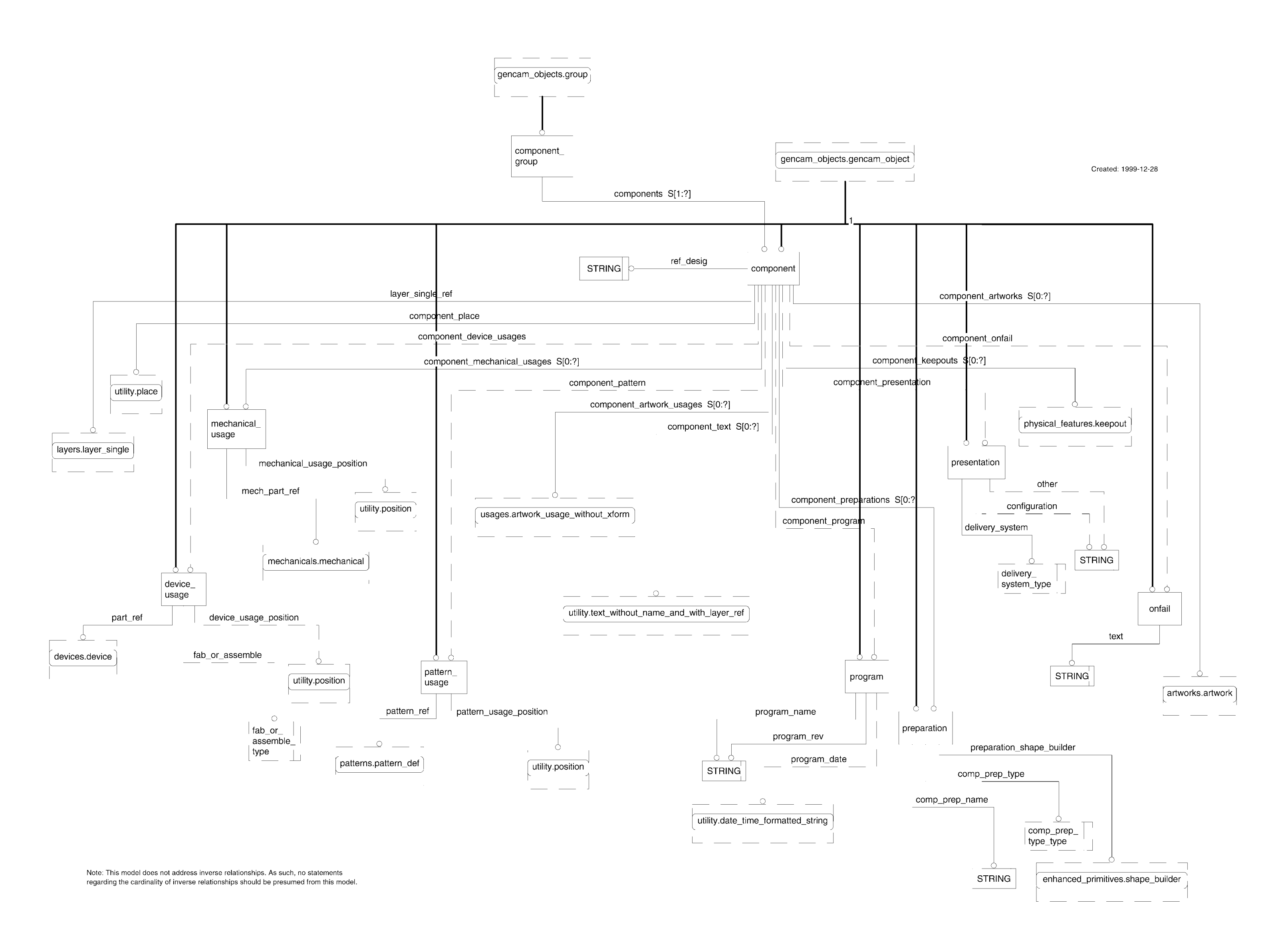


Figure 5-3 EXPRESS-G for COMPONENTS

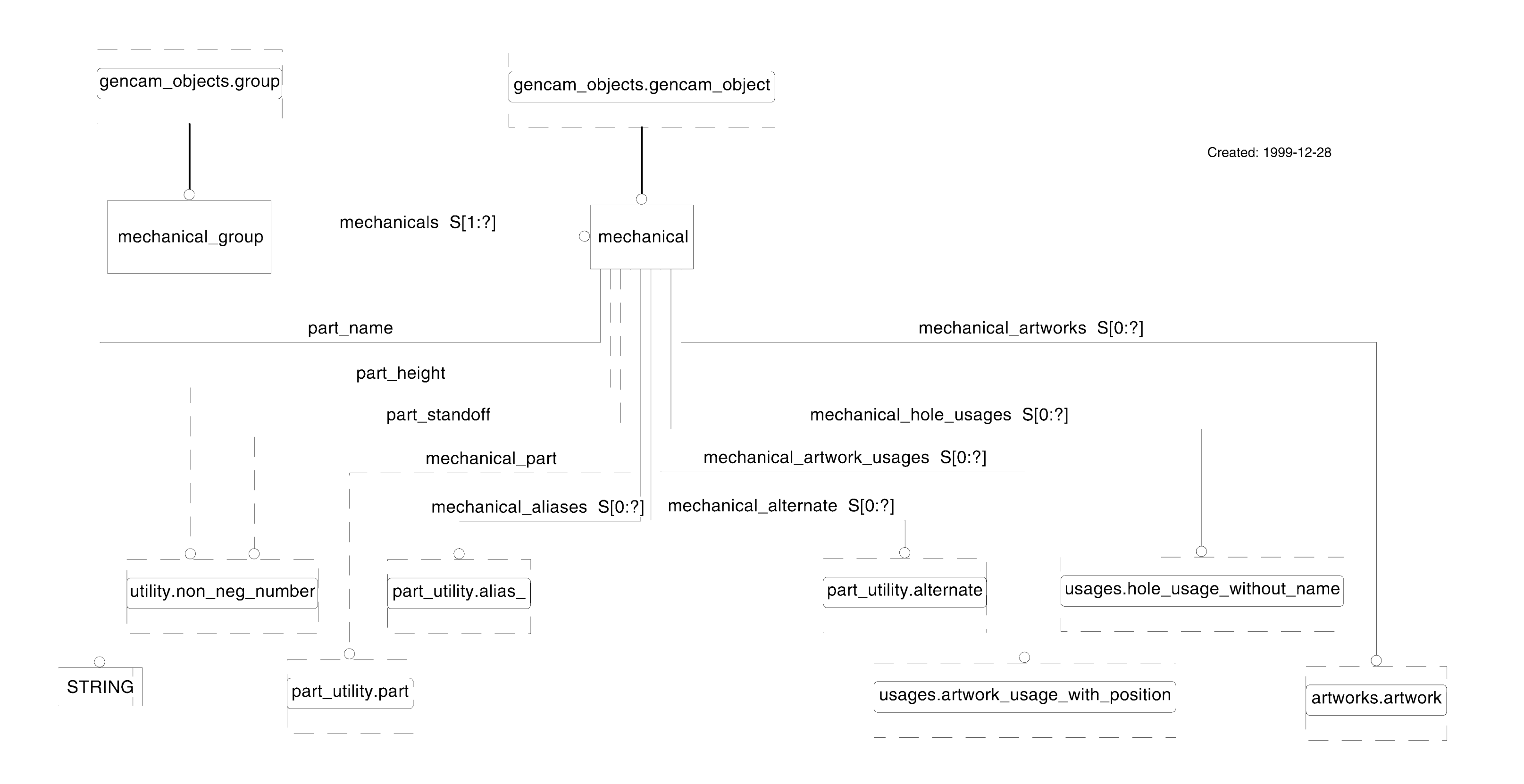


Figure 5-4 EXPRESS-G for MECHANICALS

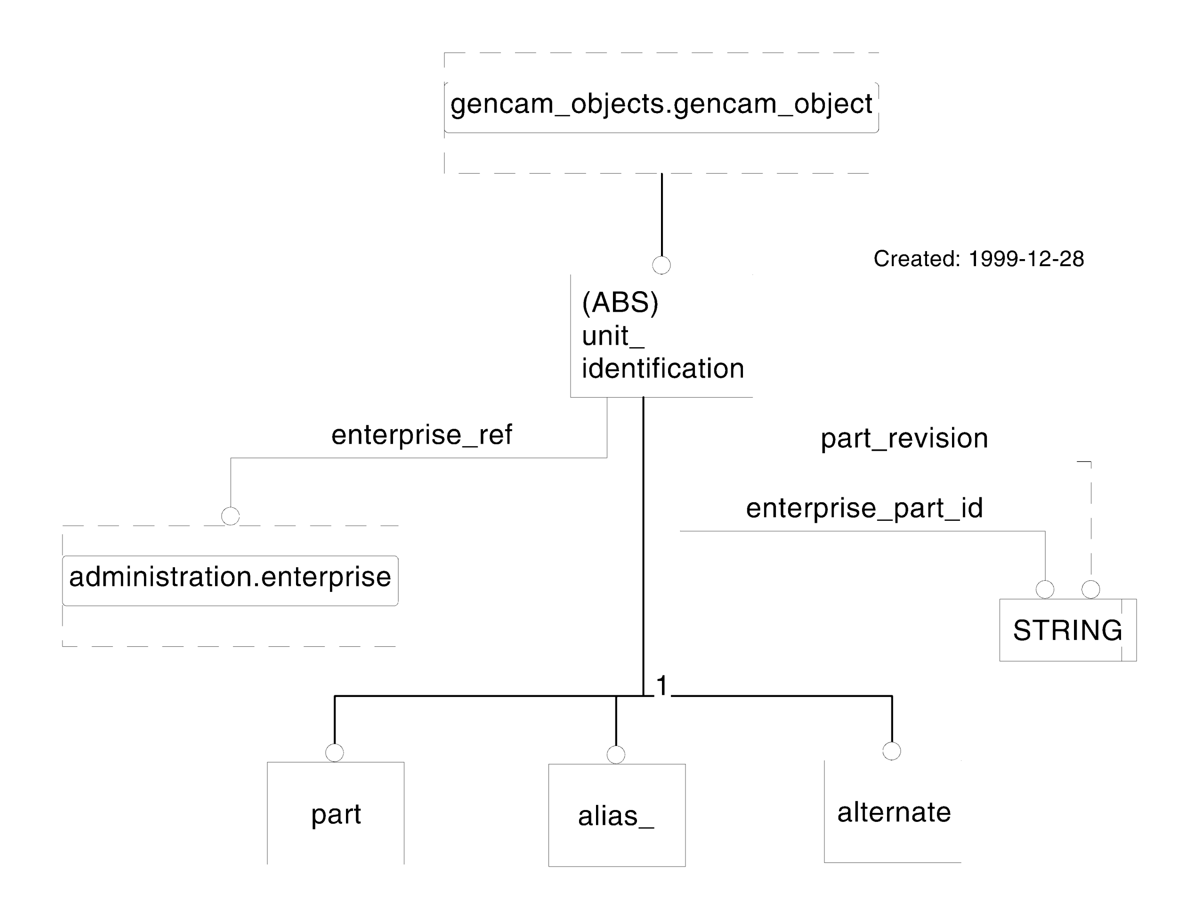


Figure 5-5 EXPRESS-G for COMPONENT alternatives

6 SYNTAX AND EXAMPLES

The following data formats represent flat files that may be populated from information models. Where possible, if more that one format exist both will be described, however a preferred format will be designated. The preferred format shall serve to create CTMs for each of the flat files necessary to completely describe the characteristics for administration.

6.1 DEVICES

The DEVICES section holds the device descriptions for all the components used on the board. These keywords apply to the device itself and do not depend upon any characteristic of the printed circuit board (i.e. are independent of PACKAGE). The DEVICES section shall be included and can use some or all of the keywords described below, in any sequence.

7 REPORT GENERATORS

Data can be extracted from GenCAM files to produce various formats that are commonly used in the electronics industry. The types of reformatting can be used for electronic data transfer to tools or to facilitate inspection and human interpretation of text and/or graphic rendering. Note that no extraction tools are included in the IPC-2510 standard. Their creation is left to the industry as the need arises.

Figure 7-1 shows an example of an extracted Parts List.

PARTS LIST, 15000173, Revision B2, 7-JAN-97								
Item	Supplier	Part #	Description	Reference Designator	Assembly Variation Quantity			
					01	02	03	04
1	Hadco	5101342	Board	BRD1	1	1		
2	Nec	8201342	Board	BRD1			1	1
3	Motorola	1N6378	Diode	D1,D2	2	2		
4	Motorola	1N6337	Diode	D1,D2			2	2
5	HP	5082-2835	Diode Schottky	D3	1	1	1	1
6	Dialight	550-3007	Connector, VME 100 pin	J1	1	1	1	1
7 Sub	Signetic Harris	74HCT125N CD74HCT125E	IC, Dip	E1	1	1	1	1
8	Signetic	74HCT126E	IC, Dip	E2	1	1		
9	Harris	CD74HCT125N	IC, Dip	E2			1	1
10	Kemet	C322C104M5U5CA	Capacitor, .1uF, 50V, Mono	C1-C3	3	3	3	3
11	Maxim	MAX238CWG	IC, SMT GULL	E3	1	1	1	1
12 Sub	Kemet MEPCO	C12062C104K5RAC 12062R104K9BB0	Cap, 1206 .1uF	C4, C5	2	2	2	2
13	BRADY	LAT-1-652-10	Label, 0.25 x 1.875		1	1	1	1
14	BRADY	LAT-1-655-08	Label		1	1	1	1

Figure 7-1 Parts List Example

8 REFERENCE INFORMATION

The following sections define reference documents that are useful in clarifying the products or process of the industry or provide additional insight into the subject of data modeling or released information models.

8.1 IPC (1)

IPC-2221 Design Standard for Rigid Printed Boards and Rigid Printed Board Assemblies
IPC-D-300 Printed Board Dimensions and Tolerances

IPC-D-310	Guidelines for Artwork Generation and Measurement Techniques for Printed Circuits
IPC-D-325	Documentation Requirements for Printed Boards, Assemblies and Support Drawings

8.2 American National Standards Institute (2)

ANSI X3/TR-1-77	American National Dictionary for Information Processing
ANSI X3.12	Subroutine Record Format Standardization
ANSI Y14.5	Dimensioning and Tolerancing for Engineering Drawing
ANSI Y32.1	Logic Diagram Standards
ANSI Y32.16	Electrical and Electrical Reference Designators
ANSI Z210.1	Metric Practice Guide (ASTM 380-72)

8.3 Department of Defense (3)

DoD-STD-100	Engineering Drawings

8.4 Electronic Industries Association (4)

EDIF 4 0 0	Electronic Data Interchange Format

8.5 International Organization for Standards (ISO)

ISO STEP Documentation

AP210	Electronic Printed Circuit Assembly: Drawings and Manufacturing
AP211	Electronic PC Assembly, Test Diagnostics & Remanufacture
AP221	Process Plant Functional Data & Schematic Representation

Appendix A

EXPRESS defines data objects and their relationships among data objects for a domain of interests. Some typical applications of data models include supporting the development of databases and enabling the exchange of data for a particular area of interest. As an example, a specific requirement of a database for an audio compact disc (CD) collection is shown in Figure 1.

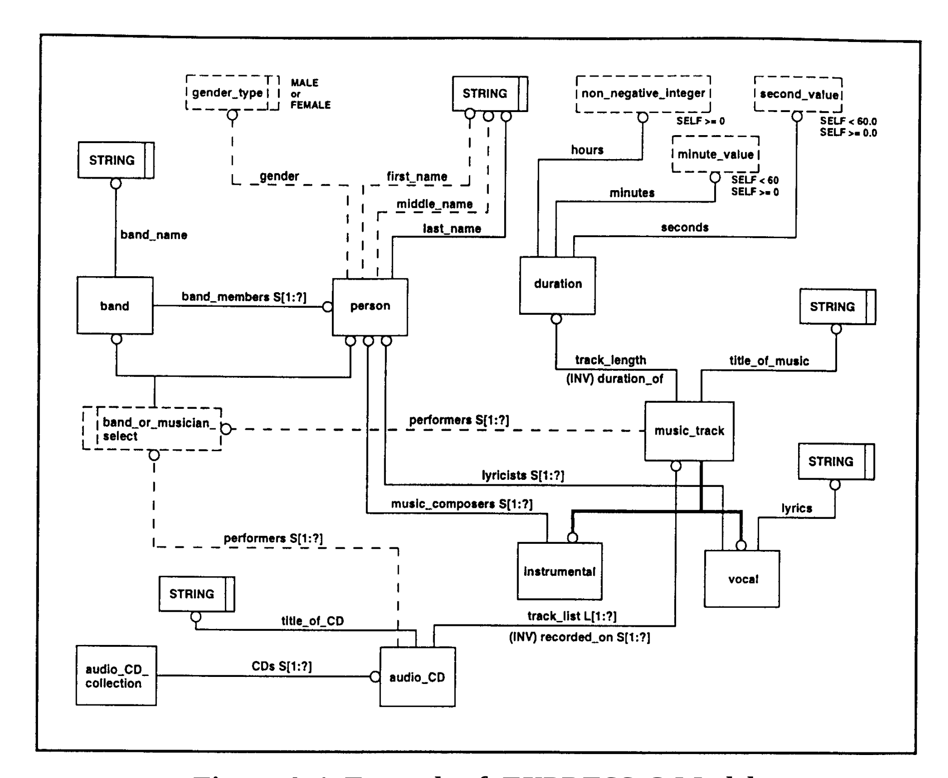


Figure A-1 Example of EXPRESS-G Model

Data models are specified in a data modeling language. EXPRESS is a data modeling language defined in ISO 10303-11. One of the advantages of using EXPRESS-G over EXPRESS is that the structure of a data model can be more intuitively presented. A disadvantage of EXPRESS-G is that complex constraints cannot be formally specified. There are specific symbols used in EXPRESS-G notation. The meaning of those symbols is defined in the EXPRESS formatting.